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Response to March 31, 2004 Office Action
Filed July 30, 2004 via facsimile transmission
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Art Unit: 2154
Examiner: H. Patel
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REMARKS/ARGUMENTS

Claims 1-24 were presented and examined. The Office Action indicated objections to informalities in the specification. The Office Action required correction of one sheet of the drawings. The Office Action indicated rejected claims 1-24 under 35 USC § 103(a), as being unpatentable over Yuasa (USPN 6,085,238) in view of Ganz (USPN 6,049,549) and Hoffman (USPN 6,094,435). In this response, Applicant has amended claims 1, 2, 4-6, 12, 13, 16, 18, and 20-21, and cancelled Claim 15. Claims 1-14 and 16-24 remain pending.

Specification Objections

The Office Action indicated objections to informalities in the specification as filed. In response, Applicant has amended the specification as indicated above to address the objections noted in the Office Action and to correct additional typographical and grammatical errors in the specification as originally filed.

Drawing Objections

The Office Action required correction the drawing sheet containing FIG. 5. In response, Applicant has submitted with this response a proposed replacement sheet and an annotated sheet showing changes. FIG. 5 has been amended in the replacement sheet by correcting the misspelled word "protocol" in block 502.

Claim rejections under 35 USC § 103(a)

The Office Action rejected claims 1-24 under Section 103(a) as unpatentable over Yuasa in view of Ganz and Hoffman.

With respect to independent claims 1, 12, and 18, Applicant has amended the claims to recite that the present invention employs prioritized host processor interrupts to initiate servicing

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of protocol data units (PDUs) that are buffered in the network interface card (NIC) of a server. These amendments recite limitations that were substantially recited in claim 15 as originally submitted (now canceled).¹

Although the Office Action summary sheet indicates claim 15 as rejected, Applicant is unable to find any reference to claim 15 or its limitation in the Detailed Action.² Accordingly, Applicant is unable to determine what portion of the cited references the Examiner relies on to support the rejection. The Examiner correctly acknowledges that neither Y nor G describe prioritizing interrupts to a host processor. Support for the rejection of claim 15, therefore, must be found in H, which does discuss priority information and processor interrupts. Upon closer inspection, however, H does not disclose or suggest the use of prioritized interrupts to initiate the servicing of buffered packets.

Hoffman describes mapping the three bits of priority information specified in an IEEE 802.01q header into two "local priority" bits. The local priority bits are then used to route packets to one of two or more output queues. The output queues are "weighted" in terms of their access to a network so that heavily weighted output queues are guaranteed to send more packets per unit of time than less heavily weighted output queues. In this manner, Hoffman teaches using priority information to distinguish between high priority packets, which are mapped to heavily weighted output queues and lower priority packets, which are mapped to less heavily weighted output queues. See, Hoffman at column 19, lines 28-36.

Hoffman does not, however, teach that priority information is used to control interrupts to a host processor where the interrupts initiate servicing of information (packets) buffered in the NIC. The only reference to processor interrupts disclosed in Hoffman describes "queue full" interrupts as follows:

To balance all the flows going out of a particular queue Q_i , discarding of packets may begin even before the queue Q_i is full. Each queue Q_i has an associated

¹ Independent claim 12 as amended is, therefore, substantially equivalent to claim 15 as originally presented. In the event that the Examiner rejects claim 12 as amended herein on newly cited art, Applicant would respectfully request the Examiner to apply the principles of MPEP 706.07(a) (prohibiting final rejections where any unamended claim is rejected on newly cited art even when other claims have been amended to require newly cited art) to such a rejection.

² The Detailed Action contains the following single sentence referring to claim 15: "As per claims 7-9, 14-17, 21-24, refer to claims 1, 4, 12, 13, 18 and 19 for rejection and combination of references." Applicant would respectfully assert that claims 1, 4, 12, 13, 18, and 19 as originally submitted did not recite anything about interrupting the processor...to service application or management PDUs as recited in claim 15.

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congestion register Ci that holds a threshold value which is less than the queue size. When the number of queue Qi entries reaches the threshold value, a discard policy is applied. Additionally, in the preferred embodiment, when the queue Qi becomes full, a "queue full" interrupt is generated.

The queues Qi may at some time contain pointers to packets that are part of a plurality of negotiated flows, such as those set up using a negotiated service-based protocol, such as RSVP. If admission control is properly done by the processor 32 in setting up the entries in the forwarding memory 40 and associated memory 42, and if all the flows are generally following their traffic specifications, a queue-full interrupt suggests that one of the flows is misbehaving and exceeding its assigned reservation.

One significant aspect of the cited passage is that the queue full interrupts of Hoffman are used to indicate exception conditions or conditions that, in one form or another, halt normal processing. Hoffman, for example, responds to a queue full interrupt by entering a monitoring mode in which it attempts to determine which flow caused a queue to become full. Hoffman at column 21, line 58 through column 22, line 23. In contrast, the interrupts of the independent claims as amended herein recite interrupting the host processor, as part of normal operational sequence, to initiate the processing, by the host, of packets that are buffered or stored in the NIC.

When used in conjunction with priority information, the present invention beneficially improves system performance by reducing the amount of overhead associated with management packet servicing. More specifically, by using priority information contained in the packets to control the interrupting of the host processor, the host processor can be interrupted less frequently for low priority packets such as management packets. In the absence of prioritizing the interrupts, management-initiated interrupts and application-initiated interrupts would occur equally or randomly, depending on the sequence in which packets arrived at the NIC, thereby potentially causing a significant amount of interrupt processing overhead on low priority packets. Thus, the present invention as recited in the amended independent claims enables or facilitates an optimized reduction in the number of processor interrupts. Hoffman does not suggest prioritizing interrupts in this way.

Although there is a weak association between the processor interrupts of Hoffman and packet priority levels in the sense that Hoffman's interrupts are issued on a per-queue basis and packets are routed into queues based on their priority, the Hoffman interrupts are error handling

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signals, which cannot be reconciled with the interrupting prioritization technique recited in the claims. One would not, for example, attempt to defer or combine Hoffman interrupts because the interrupts signal a critical condition, namely, a queue full condition that should not normally occur. In contrast, the independent claims of the present recognize that interrupts used to initiate processing of management PDU's are not generally critical (i.e., they do not generally involve client servicing or indicate a critical condition). Because the limitations of the independent claims as presented herein are not disclosed or suggested by the cited references, Applicant would respectfully request the Examiner to reconsider and withdraw the Section 103(a) rejection of the amended independent claims and all claims depending thereon.

In addition to the foregoing, Applicant has amended dependent claims 4, 5, 13, 20, and 21 to recite characteristics of the management PDUs in the present case that are not disclosed or suggest by the cited references. Dependent claims 4 and 20 now recite that the management PDUs have a single header, which is generated at a low level or data link level. Dependent claims 5, 13, and 21 recite a distinction between application PDUs, which have "high level" headers including TCP/IP headers and management PDUs which have a data link layer or MAC header only. Support for these amendments is found, for example, in the specification at the paragraph beginning on page 14, line 27.

The cited references neither disclose nor suggest the use of management packets formatted with data link or MAC headers only. Yuasa, for example, states explicitly that one of its contributions is the ability to implement virtual LANs *without adding an extra header* to the conventional packet header format. The claims under consideration go further than Y in that they recite packets that have a reduced number of headers. Similarly, G shows the packets that it generates as being subjected to a standard TCP/IP and UDP/IP protocol stack 310 (FIG. 3) that is well known to append higher level headers (e.g., IP headers and TCP headers) onto a packet. The reduced header feature of the invention enables efficient processing of the management PDU's by eliminating the need to process management PDU's up the entire protocol stack. This feature is possible in the system described because management packets are sent within a particular LAN and therefore, only need a MAC address to fully specify the location of the target system.

With respect to claims 9, 17 and 24, Applicant would respectfully traverse the Section 103(a) rejection. Claims 9 and 24 recite a feature of the invention in which the host processor is

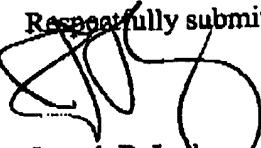
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interrupted to service the buffered management PDUs in response to detecting an absence of management PDU activity for a predetermined duration. Similarly, claim 17 recites where the host processor is interrupted after detecting an absence of application PDU activity.

The Office Action, at paragraph 10, directs Applicant to refer to claims 1, 4, 12, 13, 18 and 19 (the listed claims) for references and reasons supporting the rejection of claims 9, 17, and 24. However, because none of the listed claims recite the limitations of the claims under discussion, Applicant is not able to determine how the references have been applied to these claims. Nor does Applicant's review of the references identify any teaching of these limitations. Accordingly, Applicant would respectfully request the Examiner to withdraw the rejection of these claims or to indicate with more clarity how the references are being applied to these claims.

In this response, Applicant has addressed the objections to the specification and drawings and claim rejections under 35 USC § 103(a). Accordingly, Applicant believes that this response constitutes a complete response to each of the issues raised in the office action. In light of the amendments made herein and the accompanying remarks, Applicant believes that the pending claims are in condition for allowance. Accordingly, Applicant would request the Examiner to withdraw the rejections, allow the pending claims, and advance the application to issue. If the Examiner has any questions, comments, or suggestions, the undersigned attorney would welcome and encourage a telephone conference at 512.428.9872.

Respectfully submitted,

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Attachments